

WHAT IS CLAIMED IS:

1. A system, comprising:

5 a node including a processing subsystem and an interface coupled by an address network and a data network;

an additional node including an additional processing subsystem and an additional interface coupled by an additional address network and an additional data
10 network;

an inter-node network configured to convey communications between the node and the additional node, wherein the interface and the additional interface are coupled to send and receive communications on the inter-node
15 network;

wherein as part of a coherency transaction involving a coherency unit cached by the processing subsystem, the processing subsystem is configured to transition an access right to the coherency unit and to transition an ownership responsibility for the coherency unit, wherein the processing
20 subsystem transitions the access right at a different time than the processing subsystem transitions the ownership responsibility.

2. The system of claim 1, wherein the access right to the coherency unit cached by the processing subsystem transitions in response to the processing subsystem receiving a
25 data packet via the data network.

3. The system of claim 2, wherein the interface in the node is configured to delay providing data corresponding to the coherency unit on the data network until the interface

has received an indication that shared copies of the coherency unit in the additional node have been invalidated.

4. The system of claim 2, wherein said corresponding data packet received by the
5 processing subsystem is conveyed on the data network by the interface as part of the read-to-own transaction, wherein the interface in the node is configured to delay providing the data packet on the data network until the interface receives an indication that shared copies of the coherency unit in the additional node have been invalidated.

10 5. The system of claim 4, wherein the ownership responsibility corresponding to the coherency unit cached by the processing subsystem transitions in response to a the processing subsystem receiving a corresponding address packet via the address network.

6. The system of claim 5, wherein the address packet is sent as part of a read-to-own
15 transaction.

7. The system of claim 6, wherein the read-to-own transaction is initiated by the processing subsystem conveying the address packet on the address network.

20 8. The system of claim 7, wherein the interface is configured to forward a read-to-own message corresponding to the address packet to the additional interface via the inter-node network in response to receiving the address packet.

9. The system of claim 8, wherein the coherency unit is not mapped by any memory
25 subsystem included in the node, and wherein the additional node is a home node for the coherency unit.

10. The system of claim 7, wherein in response to receiving the address packet via the address network, a memory subsystem included in the node is configured to send a data
30 packet indicating the read-to-own transaction to the interface, wherein the interface is

configured to forward a read-to-own message on the inter-node network in response to receiving the data packet indicating the read-to-own transaction.

11. The system of claim 10, wherein the additional interface is configured to receive
5 the read-to-own message via the inter-node network and to responsively send an invalidating address packet on the additional address network, wherein if the additional processing subsystem has an access right to but not an ownership responsibility for the coherency unit, the additional processing subsystem is configured to transition its access
10 right to the coherency unit in response to the invalidating address packet.

12. The system of claim 11, wherein in response to receiving the invalidating address
15 packet on the additional address network, the additional interface is configured to send via the inter-node network a message indicating that copies of the coherency unit in the additional node have been invalidated to the interface.

13. The system of claim 12, wherein the additional interface is configured to send an
20 additional address packet on the address network, wherein if the additional processing subsystem has an ownership responsibility associated with the coherency unit, the additional processing subsystem is configured to transition the ownership responsibility
25 to the coherency unit upon receiving the additional address packet.

14. The system of claim 13, wherein the additional processing subsystem is
30 configured to send a data packet corresponding to the coherency unit to the additional interface in response to receiving the additional address packet, wherein the additional processing subsystem is configured to transition an access right associated with the coherency unit in response to sending the data packet corresponding to the coherency unit.

15. The system of claim 1, wherein the address network implements an ordered
30 broadcasts property.

16. The system of claim 1, wherein the address network and the data network implement a synchronized broadcasts property.

5 17. The system of claim 1, wherein the access right to the coherency unit cached by the processing subsystem transitions in response to the processing subsystem receiving a data packet via the data network, wherein the data packet is provided to the processing subsystem as part of a write stream transaction initiated by the processing subsystem.

10 18. The system of claim 17, wherein the data packet is an encoded acknowledgment that excludes data corresponding to the coherency unit.

19. A system, comprising:

15 a node including a processing subsystem and an interface coupled by an address network and a data network;

an additional node including an additional processing subsystem and an additional interface coupled by an additional address network and an additional data
20 network;

an inter-node network configured to convey communications between the node and the additional node, wherein the interface and the additional interface are coupled to send and receive communications on the inter-node
25 network;

wherein the processing subsystem is configured to transition an access right to a coherency unit in response to a data packet on the data network and to transition an ownership responsibility for the coherency unit in response to
30 an address packet on the address network.

20. The system of claim 19, wherein the address packet and the data packet are part of a transaction initiated by the processing subsystem, wherein the transaction also includes an additional address packet sent on the additional address network and at least one
5 message sent on the inter-node network.

21. The system of claim 20, wherein the interface within the node is configured to delay providing the data packet on the data network until the interface receives an indication from the additional interface via the inter-node network that any shared copies
10 of the coherency unit in the additional node have been invalidated.

22. The system of claim 21, wherein the additional interface is configured to broadcast an invalidating address packet on the additional address network in response to receiving a message indicating the transaction from the interface via the inter-node
15 network.

23. The system of claim 21, wherein the additional interface is configured to send an acknowledging message to the interface via the inter-node network in response to the additional interface receiving the invalidating address packet on the additional address
20 network, wherein the acknowledging message includes the indication that shared copies of the coherency unit in the additional node have been invalidated;

wherein if the additional processing subsystem has an access right to but not ownership of the coherency unit, the additional processing subsystem is
25 configured to transition the access right to the coherency unit upon receipt of the invalidating address packet.

24. The system of claim 20, wherein the transaction is a read-to-own transaction, wherein the processing subsystem is configured to initiate the read-to-own transaction by
30 sending a read-to-own packet on the address network.

25. The system of claim 24, wherein no memory subsystem included in the node maps the coherency unit;

5 wherein in response to the read-to-own packet on the address network, the interface is configured to send a read-to-own message to the additional interface in the additional node.

26. The system of claim 19, wherein the address network is configured to convey the address packet from a directory to the processing subsystem in point-to-point mode.
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27. The system of claim 19, wherein the address network is configured to convey the address packet in broadcast mode.

15 28 A system, comprising:

a node including a processing subsystem and an interface coupled by an address network and a data network;

20 an additional node including an additional processing subsystem and an additional interface coupled by an additional address network and an additional data network;

25 an inter-node network configured to convey communications between the node and the additional node, wherein the interface and the additional interface are coupled to send and receive communications on the inter-node network;

wherein the processing subsystem is configured to transition an access right to a coherency unit in response to sending a data packet corresponding to the coherency unit on the data network;

5 wherein the interface within the node is configured to delay providing an additional data packet corresponding to an additional coherency unit on the data network until the interface receives via the inter-node network an indication that a shared copy of the additional coherency unit in the additional node has been invalidated.

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29. A node for use in a multi-node system, the node comprising:

an address network and a data network;

15 a plurality of client devices coupled to send and receive packets on the address network and the data network; and

an interface to an additional node in the multi-node system, wherein the interface is coupled to send and receive packets on the address network and the data network, wherein the interface is configured to provide a data packet on the data network in response to an indication that shared copies of the coherency unit in the additional node have been invalidated;

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wherein the plurality of client devices includes an active device that includes a cache and is configured to transition an access right to a coherency unit stored in the cache in response to the data packet on the data network and to transition an ownership responsibility for the coherency unit in response to an address packet on the address network, wherein the access right transitions at a different time than the ownership responsibility transitions.

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30. A method, comprising:

a processing subsystem in a node requesting an access right to a coherency unit by conveying an address packet on an address network included in the node;

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an interface in the node delaying providing a data packet corresponding to the coherency unit on a data network included in the node until the interface receives an indication that shared copies of the coherency unit in an additional node have been invalidated, wherein the additional node includes a different address network and a different data network;

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the processing subsystem gaining the access right to the coherency unit in response to the data packet on the data network; and

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the processing subsystem transitioning an ownership responsibility for the coherency unit in response an address packet on the address network, wherein said gaining occurs at a different time than said transitioning.

31. The method of claim 30, wherein the address packet is a read-to-own packet.

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32. The method of claim 31, further comprising:

the interface sending a read-to-own message to an additional interface in the additional node in response to said requesting;

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the additional interface sending an invalidating packet on the different address network included in the additional node in response to receiving the read-to-own message; and

an additional processing subsystem in the additional node transitioning an access right to the coherency unit to an invalid access right in response to receiving the invalidating packet on the different address network.

5 33. The method of claim 32, further comprising the additional interface providing the indication that the shared copy of the coherency unit in the additional node has been invalidated to the interface in response to receiving the invalidating packet on the different address network.

10 34. A node for use in a multi-node system, the node comprising:

means for processing data, wherein the means for processing data include a cache;

means for interfacing to an additional node in the multi-node system;

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means for communicating address packets between the means for processing data and the means for interfacing to the additional node, wherein the means for communicating address packets is independent of a means for communicating address packets included in the additional node;

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means for communicating data packets between the means for processing data and the means for interfacing to the additional node, wherein the means for communicating data packets is independent of a means for communicating data packets included in the additional node;

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wherein the means for interfacing to the additional node are configured to delay providing a data packet corresponding to a coherency unit on the means for communicating data packets until receipt of an indication that a shared copy of the coherency unit in the additional node has been invalidated;

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wherein the means for processing data are configured to transition an access right to the coherency unit in response to receiving the data packet corresponding to the coherency unit on the means for communicating data packets;

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wherein the means for processing data are configured to transition an ownership responsibility for the coherency unit in response to an address packet on the means for communicating address packets.